

# WITH SKIDDER AND LOAD DOWN THE SKID TRAIL – DOES IN THIS CASE A SLIP OF THE WHEEL ALSO INFLUENCE THE FOREST GROUND?

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## Keywords???

- Skidder
- Downhill skidding
- Slip
- Pulling force



## The point of interest :

- downhill skidding,
- not deal with the problems of the machine overcoming because of too difficult skidding conditions,
- dependence and connection in traction - totally different principles comparing usually presented uphill skidding.



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## Usually situation in uphill skidding:

- steep terrain,
- heavy loads and special machinery,
- relation – problems - wheel and the surface,
- skidding uphill – ground influences are expectedly higher.

### What are the facts in uphill:

- more tractive force,
- the torques on wheels are increased,
- the slip increases due to the slope of skid trail.



## Is the slip acceptable to the environment in downhill skidding?



- Is it enough to deal only with uphill skidding?
- Downhill - technically speaking - not represent many problems.
- It is rarely discussed.
- Dependence and connection is based on totally different laws.



## Some technical characteristics of the skidder Woody 110

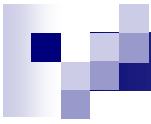
Weight with equipment* (daN)	7006
Length (mm)	5400 mm
Height (mm)	2750
Width (mm)	2200
Engine	Perkins 1004-40T
Torque (Nm – rev/min)	403 - 1400
Power (kW – rev/min)	76.5 - 2200

\*Basic tractor, cabin (safety frame), attached or built-in winch with wire rope, front and rear blade, wheel chains.



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**Measuring equipment installed on the skidder**

In downhill:

- pulling force,
- different slopes of skid trail,
- weight on the wheel,
- **slip.**

The most focus is paid to the slip – damaging effect!!!



**The slip measurements**

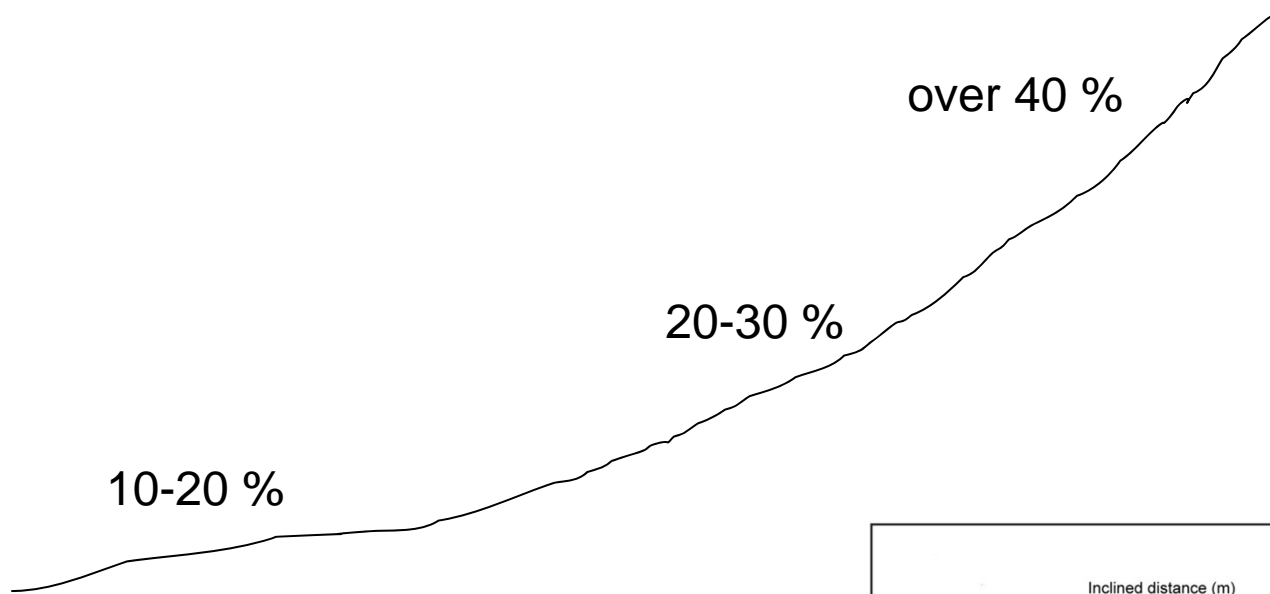
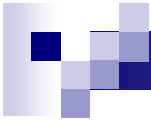




## The load:

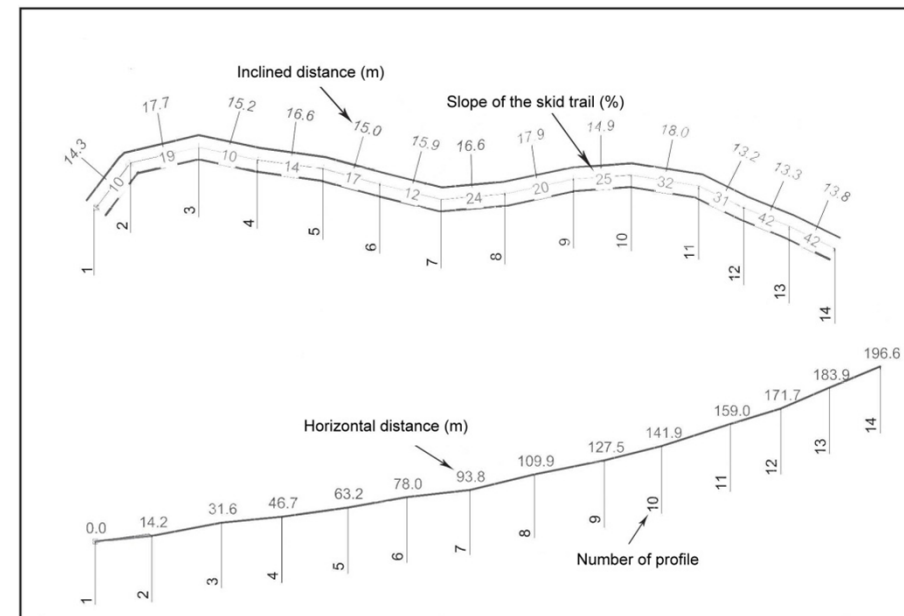
- 6 m<sup>3</sup>,
- 4 pieces, 8 m long,
- fir tree with bark,
- butt-end forward.





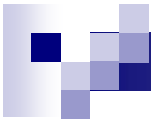
## The skid trail:

- 200 m long, concave shape,
- with the biggest slope of 42 %.

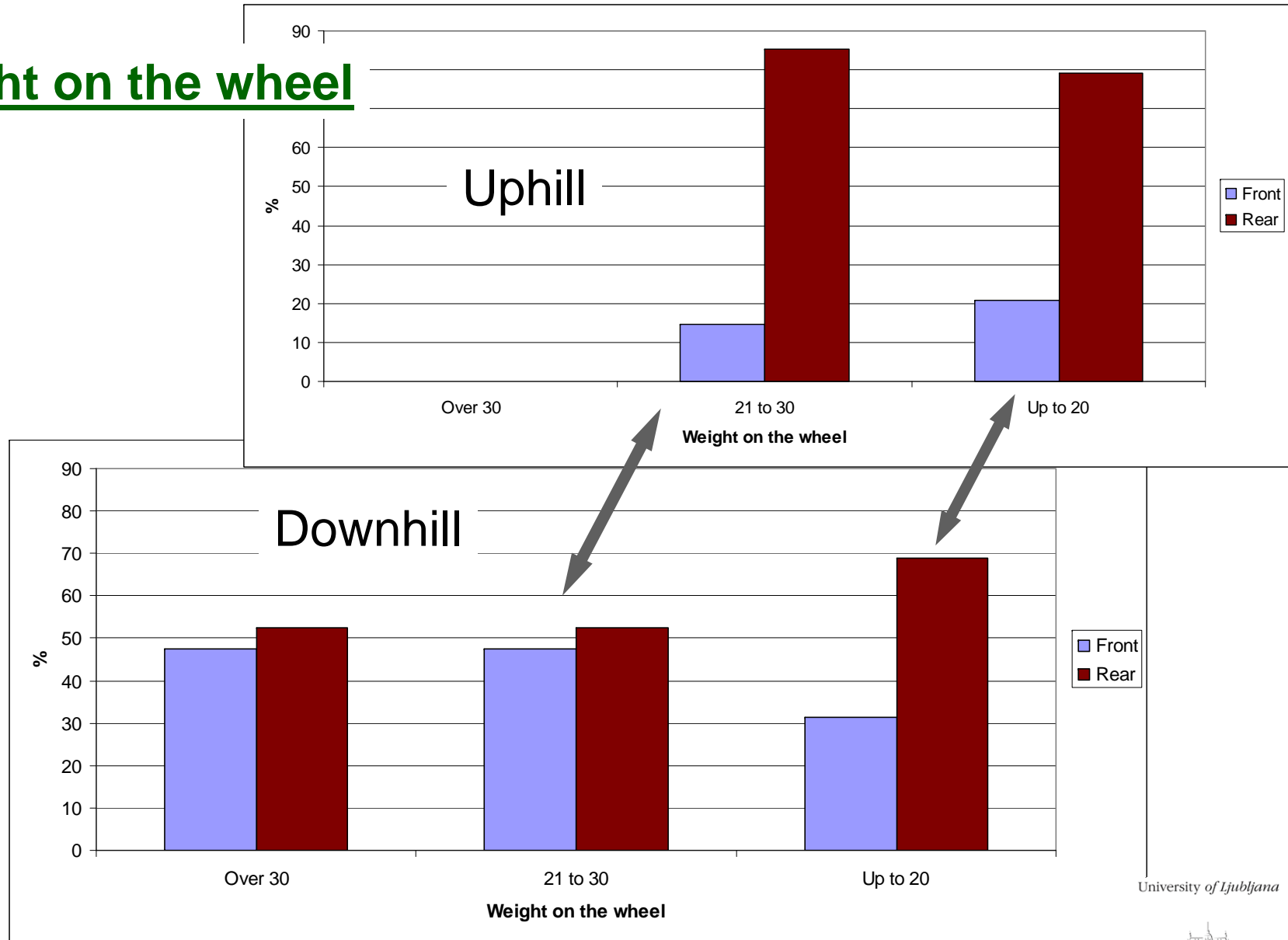


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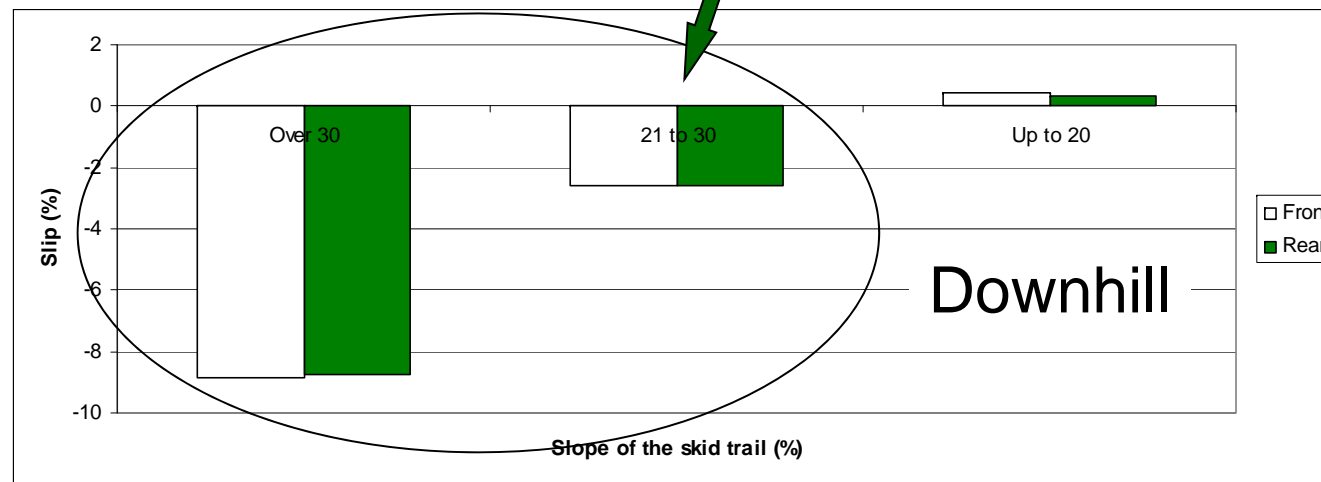
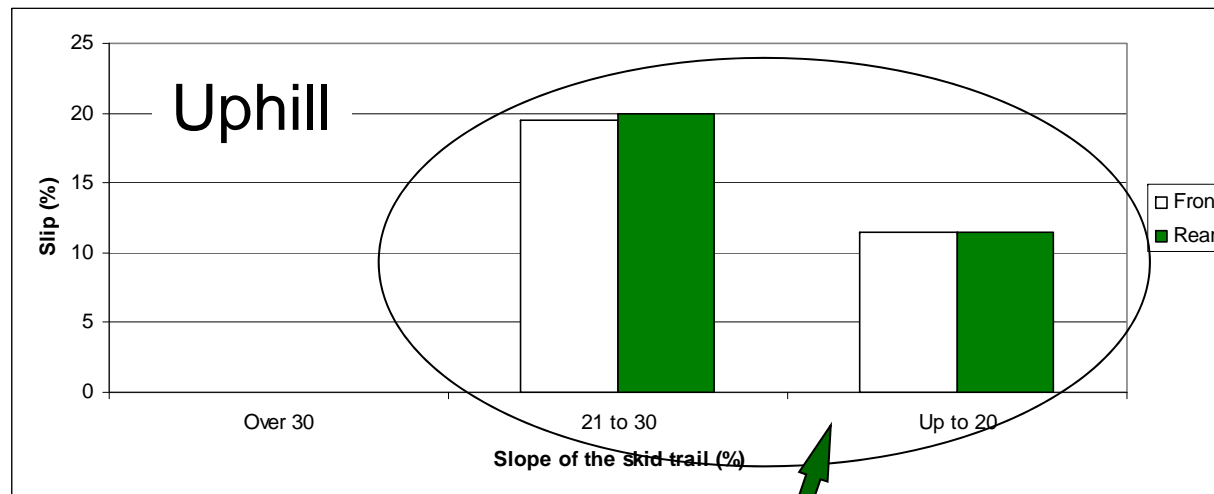
## Weight on the wheel



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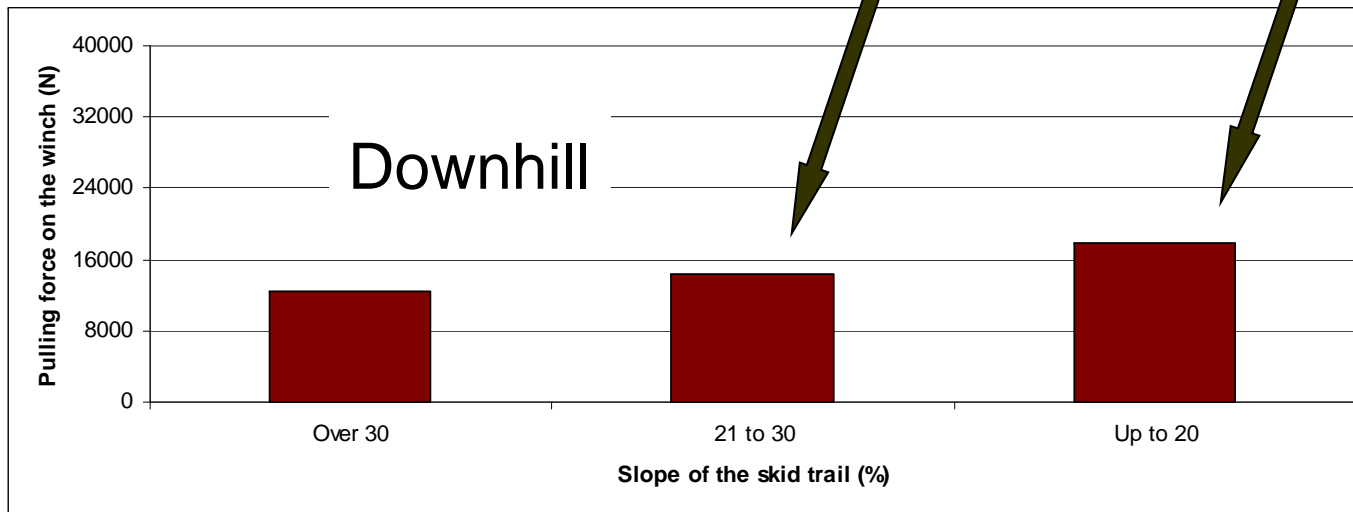
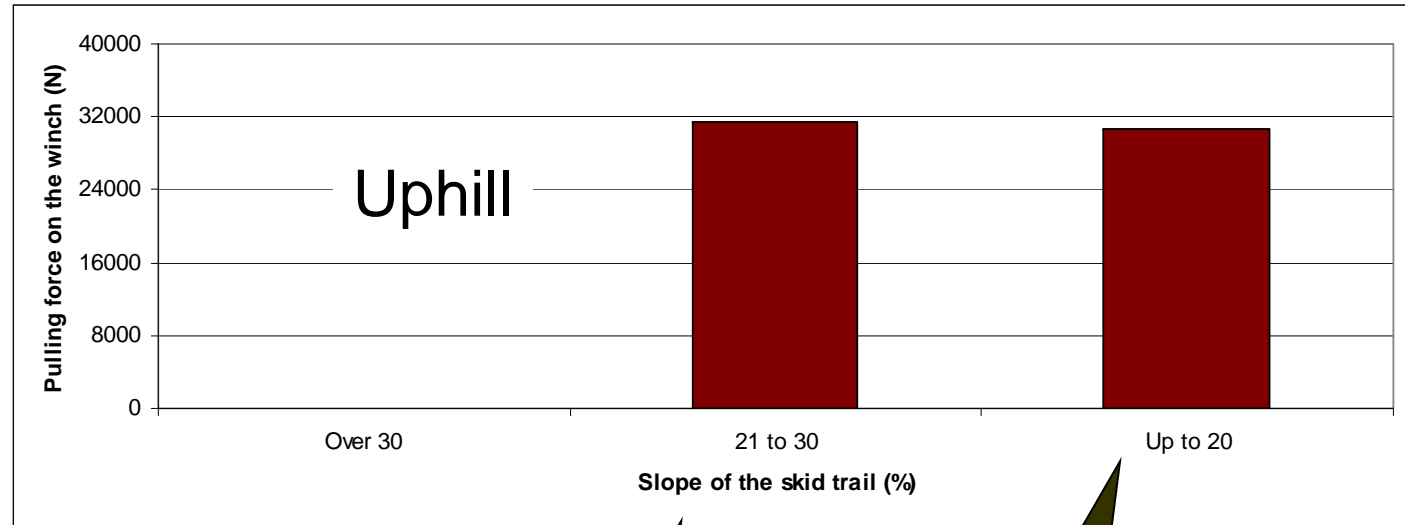
# Slip



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# Pulling force



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Conclusion???

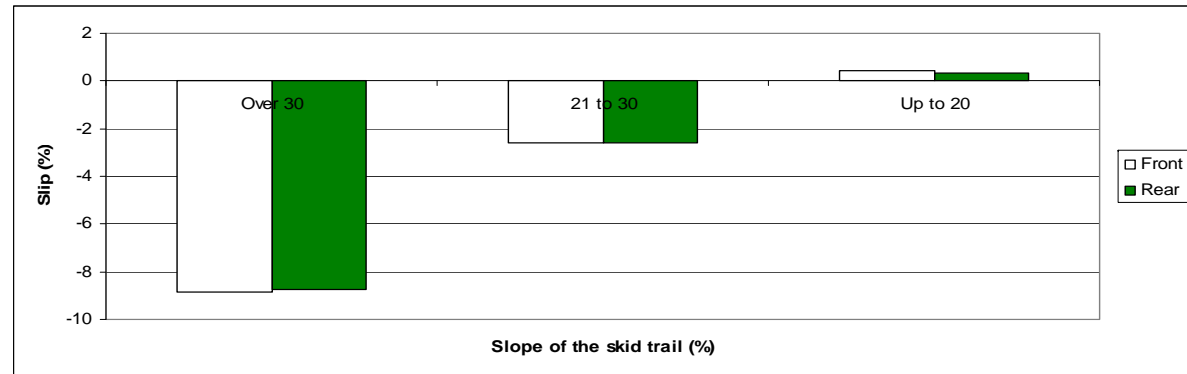
Up- and (or) downhill?



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## Conclusions: about the slip



Slip - in proportion - slope and load size.

Uphill skidding - positive slip.

Slip consequence - removing of the ground!!!

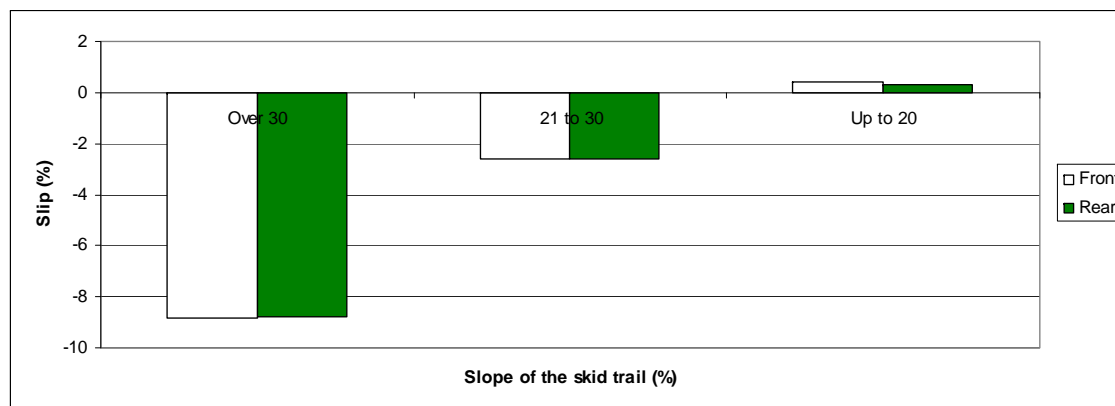
Smaller wheel slip - smaller ground damage!!!

6 m<sup>3</sup> load – downhill – slip almost all the time negative  
and smaller!

The values between 8 and 9 %.

No significant differences between front and back axis.

## Conclusions: about the slip



In less steep section –  
slip decreased, still remained in the negative values.

All four driving wheels brake during the downhill movement due to gravity.

At the end, slopes up to 20 %, the slip was the smallest, first time positive (gravity the smallest).



## Conclusions: about the pulling force (uphill)

- Influence on the pulling force - the slope and load size.
- The limits in uphill skidding – oversize load or longitudinal slope.
- The smallest pulling force - in the steepest slope.



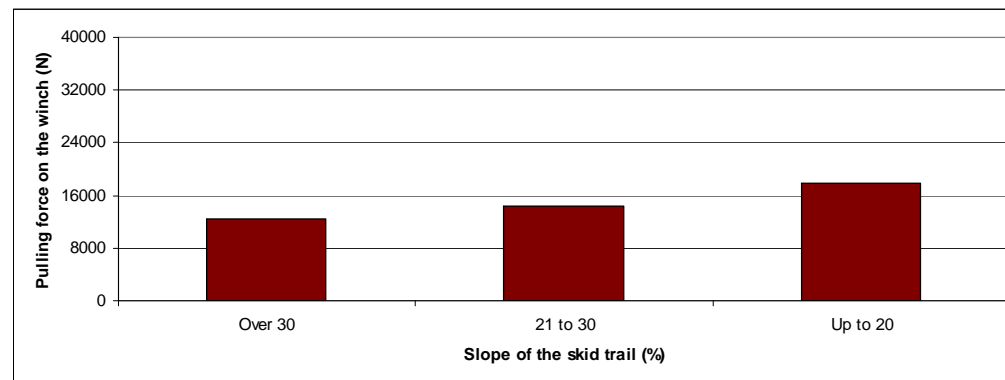
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## Conclusions: about the pulling force (downhill)

- 6 m<sup>3</sup> of load, slopes above 30 %, 12 kN of pulling force was needed (influence of the gravity is the highest).
- The necessary pulling force was changing – in the lowest steep section reached 18 kN.
- The ratio between load mass (4729 kg) and the required force.
- In the steepest part - 25 % of the total mass is necessary.
- In the least steep section - the force equals 38 %.





## Conclusions

- Comparing uphill and downhill skidding - impacts on the ground is significantly different (lower forces and slip).
- Does the slip actually happens - what is its extent and type!?
- That ground damages are not specifically analysed in this paper – we can only conclude according to the size of wheel slip. It is always lower compared uphill skidding.
- The gravity influences on the pulling force on the winch wire rope – in smaller slopes it is expectedly higher.



**Instead of “the last page” and “thank you for your attention”:**



**We probably agree:**

- “downhill work” is easier,
- “downhill slip” is smaller,
- the most important ground damage as well...

**...but how in more steep terrain:**

- the gravity of the load?
- skidder stability?
- safety of the driver...?

